IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND claims 1, 2, 3, 9, 16 and 17 and ADD new claims 18 and 19 in accordance with the following:

1. (currently amended) An optical amplifier having a polarization mode dispersion compensation function comprising:

a polarization control section that controls a polarization state of input signal light;

a polarization mode dispersion generation section that has an optical transmission medium which has birefringence capable of giving a differential group delay between orthogonal polarization mode components of the signal light controlled in said polarization control section, and which is doped with a rare earth element;

a pumping light supply section that applies pumping light capable of pumping said rare earth element, to the optical transmission medium in said polarization mode dispersion generation section;

a monitoring section that monitors a polarization mode dispersion generation state of the signal light output from said polarization mode dispersion generation section; and

~~and~~ a control section that controls said polarization control section so that polarization mode dispersion monitored in said monitoring section, is reduced.

2. (currently amended) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein said monitoring section monitors the power of signal light output from said polarization mode dispersion generation section, and

said control section controls said pumping light supply section so as to obtain a gain which makes the power of signal light monitored by said monitoring section to be the power at the time of input or above.

3. (currently amended) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein said monitoring section monitors the power of signal light output from said polarization mode dispersion generation section, and

said control section controls said pumping light supply section so that the power of signal light monitored by said monitoring section is fixed to be constant at a previously set value.

4. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein said polarization mode dispersion generation section uses a polarization-preserving fiber as said optical transmission medium, and a light propagation region centering on a core of said polarization-preserving fiber is doped with a rare earth element.

5. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein said polarization mode dispersion generation section uses an optical waveguide having birefringence which is formed on a substrate, as said optical transmission medium, and at least the optical waveguide on said substrate is doped with a rare earth element.

6. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 5,

wherein said optical waveguide is an optical waveguide made of lithium niobate.

7. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 5,

wherein said optical waveguide is an optical waveguide having variable refraction index, which is formed in a planar light-wave circuit.

8. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 5,

wherein said polarization control section has an optical transmission medium of optical waveguide type doped with a rare earth element, and

said pumping light supply section supplies pumping light to each optical transmission medium of said polarization control section and said polarization mode dispersion generation section.

9. (currently amended) An optical amplifier having a polarization mode dispersion compensation function according to claim 1, wherein said monitoring section comprises:

a branching device which branches a part of the signal light output from said polarization mode dispersion generation section, as monitor light;

an output monitor which monitors ~~the~~ a power and the polarization mode dispersion generation state of the monitor light branched by said branching device; and

a pumping light interception device having a property for transmitting the signal light and intercepting the pumping light, which prevents leaked light of the pumping light supplied to said polarization mode dispersion generating section, from being input to said output monitor.

10. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 9,

wherein said pumping light interception device is an optical filter, which transmits the signal light and intercepts the pumping light, arranged on an optical path of a main signal system positioned between said polarization mode dispersion generation section and said branching device, or on an optical path of a monitor system positioned between said branching device and said output monitor.

11. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 9,

wherein said pumping light interception device is an optical isolator in which a loss is greater to the pumping light than to the signal light, arranged on an optical path of a main signal system positioned between said polarization mode dispersion generation section and said branching device.

12. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein an optical filter having a property for transmitting the signal light and intercepting the pumping light and amplified spontaneous emission light generated accompanying amplification of the signal light in said polarization mode dispersion generation section, is provided on an optical path through which the signal light is propagated.

13. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein when said polarization mode dispersion generation section is constructed by cascade connecting a plurality of optical transmission media having birefringence, a rare earth element is doped on at least the optical transmission media disposed on the signal light input side among said plurality of optical transmission media, and

said pumping light supply section supplies forward pumping light to the optical transmission media doped with the rare earth element, of said polarization mode dispersion generation section.

14. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein when said polarization mode dispersion generation section is constructed by cascade connecting a plurality of optical transmission media having birefringence, a rare earth element is doped on at least the optical transmission media disposed on the signal light output side among said plurality of optical transmission media, and

said pumping light supply section supplies backward pumping light to the optical transmission media doped with the rare earth element, of said polarization mode dispersion generation section.

15. (original) An optical amplifier having a polarization mode dispersion compensation function according to claim 1,

wherein when said polarization mode dispersion generation section is constructed by cascade connecting a plurality of optical transmission media having birefringence, a rare earth element is doped on said plurality of optical transmission media, and

said pumping light supply section supplies forward pumping light to the optical transmission media disposed on the signal light input side, and supplies backward pumping light to the optical transmission media disposed on the signal light output side, among the plurality of optical transmission media doped with the rare earth element, of said polarization mode dispersion generation section.

16. (currently amended) An optical amplifier having a polarization mode dispersion compensation function,

wherein the optical amplifier of claim 1 is made <u>of</u> one unit, and a plurality of units are disposed in parallel corresponding to a plurality of signal lights contained in a wavelength group, and common components of said units are integrated.

17. (currently amended) An optical amplifier having a polarization mode dispersion compensation function according to claim 16,

wherein a configuration where common monitoring sections of said units are integrated, is provided with:

an optical switch which selects any one of the signal lights output from the polarization mode dispersion generation sections of the respective units and outputs a part of said signal light, as monitor light; and

an output monitor which is shared by each of said units, and which monitors the polarization mode dispersion generation state and an optical power of the monitor light output from said optical switch.

18. (new) An optical amplifier having a polarization mode dispersion compensation function, comprising:

a polarization control section that controls a polarization state of input signal light;

a polarization mode dispersion generation section having an optical transmission medium with a rare earth element;

a pumping light supply section that applies pumping light to the optical transmission medium;

a monitoring section that monitors a polarization mode dispersion generation state of the signal light output from said polarization mode dispersion generation section; and

a control section that controls said polarization control section, so that polarization mode dispersion monitored in said monitoring section, is reduced.

19. (new) A method of controlling an optical amplifier having a polarization mode dispersion compensation function comprising:

controlling a polarization state of input signal light;

receiving the input signal light and performing polarization mode dispersion compensation;

monitoring a polarization mode dispersion generation state of the input signal light after said polarization mode dispersion compensation is performed; and

reducing the polarization mode dispersion monitored in said monitoring by said controlling the polarization state of the input signal light.

REMARKS

In the Office Action, the Examiner noted that claims 1-17 were pending in the application and the Examiner rejected all claims. By this Amendment, various claims have been amended and new claims 18 and 19 have been added. Thus, claims 1-19 are pending in the application. The Examiner's rejections are traversed below.

REJECTION UNDER 35 U.S.C. § 102

In items 2-10 on pages 2-6 of the Office Action, the Examiner rejected claims 1-4, 9 and 12-14 under 35 U.S.C. § 102 as anticipated by U.S. Patent 5,943,162 to Kosaka et al.

THE PRESENT INVENTION

The present invention as set forth, for example, in claim 1 is directed to an optical amplifier having a polarization mode dispersion compensation function. The optical amplifier includes a polarization control section that controls a polarization state of input signal light. A polarization mode dispersion generation section has an optical transmission medium which has birefringence capable of giving a differential group delay between orthogonal polarization mode components of the signal light controlled in the polarization control section. The optical transmission medium is doped with a rare earth element. A pumping light supply section applies pumping light capable of pumping the rare earth element, to the optical transmission medium in the polarization mode dispersion generation section. A monitoring section monitors a polarization mode dispersion generation state of the signal light output from the polarization mode dispersion generation section, and a control section controls the polarization control section so that polarization mode dispersion monitored in the monitoring section, is reduced.

THE KOSAKA ET AL. REFERENCE

The Kosaka et al. reference is directed to an optical amplifier, optical amplifying method and optical transmission system using the optical amplifier. Figure 2 of Kosaka et al. is a diagram showing a basic configuration of an optical amplifier 1 and an input port 2 for receiving transmitted signal light. A polarized-wave identifying/synthesizing unit 3 receives the transmitted signal light and synthesizes the signal lights into signal lights with their polarization states discriminatable from each other for one or more output ports. The signal lights with discriminatable polarization states are applied to a polarization maintaining optical amplifying

medium 4 for optically amplifying the signal lights with their polarization states maintained. The polarization maintaining optical amplifier medium 4 is excited by an exciting unit 6 for selectively exciting the signal lights by using exciting lights introduced by way of an introduction unit 5. The amplified signal lights are then supplied to the polarized-wave separating unit 7 by way of the introduction unit 5. The polarized-wave separating unit 7 identifies the polarization states of the optically amplified signal lights coming from the polarization maintaining optical amplifying medium 4, and separates the signal lights from each other before supplying them to a branching unit 8 for splitting. Some of the lights split by the branching unit 8 are supplied to a detection unit 9 for monitoring the split lights. The split lights are then supplied to a controller 10 for controlling the exciting unit 6 so as to adjust the amplified signal lights to predetermined values. (Column 8, line 47 to column 9, line 33).

In the Office Action, the Examiner alleged the following correspondence between the features of claim 1 and the disclosure in Kosaka et al.:

CLAIM 1 FEATURE	DISCLOSURE IN KOSAKA ET AL.
A polarization control section	Polarized - wave identifying/synthesizing unit 3
A polarization mode dispersion generation section	Polarization maintaining optical amplifying medium 4
A pumping light supply section	Exciting unit 6
A monitoring section	Detection unit 9
A control section	Controller 10

CLAIM 1 PATENTABLY DISTINGUISHES OVER THE PRIOR ART

It is submitted that Kosaka et al. does not teach or suggest the claimed polarization control section that controls a polarization state of input signal light. In addition, Kosaka et al. does not teach or suggest the claimed monitoring section that monitors a polarization mode dispersion generation state of the signal light output from the polarization mode dispersion generation section, or a control section that controls the polarization control section so that polarization mode dispersion monitored in the monitoring section, is reduced.

In Kosaka et al, the signal lights input to the polarized-wave identifying/synthesizing unit 3 through the transmitted-signal-light input ports 2 are synthesized into signal lights with polarization states discriminatable from one another as described in column 9, lines 4-8 of

Kosaka et al. At this stage, the technical meaning of the discriminatable polarization states of the signal lights is to supply the input signal lights to polarizers 12a and 12b as illustrated in Figures 3 and 4 of Kosaka et al. More specifically, only the signal lights with a specific polarization state out of the signal lights with the arbitrary polarization states, are allowed to pass through the polarizers 12a and 12b, so that the passed signal lights are polarized into mutually orthogonal polarization states as described at column 10, lines 4-7 and 28-39 of Kosaka et al.

In view of the above, the polarized-wave identifying/synthesizing unit 3 of Kosaka et al. can be defined as a unit having a function of fixing the signal lights input thereto at arbitrary polarization modes into those with specific polarization states so as to output them to the polarization maintaining optical amplifying medium 4. The unit 3 is not provided with a function of making the above-mentioned specific polarization states variable. This is further supported by the disclosure of Kosaka et al. which states that the powers of the output signal lights are detected by the detection unit 9, and the exciting unit 6 is controlled by the controller 10, so that the detected powers of the output signal lights are maintained at predetermined levels as described in column 11, lines 54-61 of Kosaka et al. Thus, the polarization states of the output signal lights are not monitored by the detection unit 9, and the polarized-wave identifying/synthesizing unit 3 is not controlled by the controller 10 of Kosaka et al.

In the present claimed invention as set forth in claim 1, the polarization states of the input signal lights are variably controlled by the polarization control section and therefore the differential group delay given between orthogonal polarization mode components of the signal light by the polarization mode dispersion generation section can be made optimum. As a result, the polarization mode dispersion compensation of the signal lights is performed. This kind of polarization mode dispersion compensation function cannot be exhibited by the optical amplifier of Kosaka et al. In particular, it is submitted that Kosaka et al. does not teach or suggest:

> a polarization control section that controls a polarization state of input signal light; . . .
>
> a monitoring section that monitors a polarization mode dispersion generation state of the signal light output from said polarization mode dispersion generation section; and
>
> a control section that controls said polarization control section so that polarization mode dispersion monitored in said monitoring section, is reduced.

In view of the above, it is submitted that claim 1 patentably distinguishes over the prior art.

CLAIMS 2-4, 9 AND 12-14

Claims 2-4, 9 and 12-14 depend directly or indirectly, from claim 1 and include all the features of that claim plus additional features which are taught or suggested by the prior art. Therefore, it is submitted that claims 2-4, 9 and 12-14 patentably distinguish over the prior art.

REJECTIONS UNDER 35 U.S.C. § 103

On pages 6 and 7 of the Office Action, the Examiner rejected claims 5-8, 10-11 and 15-17 under 35 U.S.C. § 103 as unpatentable over various combinations of Kosaka and U.S. Patent No. 6,301,273 to Sanders et al. and U.S. Patent Application No. 10/854,347 to Hwang et al.

Claims 5-8, 10-11 and 15-17 depend, directly or indirectly, from claim 1 and include all the features of that claim plus additional features which are not taught or suggested by the prior art. Further, it is submitted that neither Sanders nor Hwang et al. cure the deficiencies of Kosaka et al. Therefore, it is submitted that claims 5-8, 10-11 and 15-17 patentably distinguish over the prior art.

NEW CLAIMS 18 AND 19

New claim 18 is directed to an optical amplifier which includes:

> a polarization control section that controls a polarization state of input signal light;
> a polarization mode dispersion generation section having an optical transmission medium with a rare earth element;
> a pumping light supply section that applies pumping light to the optical transmission medium;
> a monitoring section that monitors a polarization mode dispersion generation state of the signal light output from said polarization mode dispersion generation section; and
> a control section that controls said polarization control section, so that polarization mode dispersion monitored in said monitoring section, is reduced.

Therefore, it is submitted that claim 18 patentably distinguishes over the prior art.

New claim 19 is directed to a method of controlling an optical amplifier which includes:

> controlling a polarization state of input signal light;
> receiving the input signal light and performing polarization mode dispersion compensation;
> monitoring a polarization mode dispersion generation state of the input signal light after said polarization mode dispersion compensation is performed; and
> reducing the polarization mode dispersion monitored in said monitoring by said controlling the polarization state of the input signal light.

Therefore, it is submitted that claim 19 patentably distinguishes over the prior art.

INFORMATION DISCLOSURE STATEMENT

Applicants have noted that the PTO-1449 Form returned by the Examiner has not been fully initialed. It is respectfully requested that the Examiner also initial references AD through AG of the PTO Form 1449 to confirm that these documents have been considered. A copy of the PTO-1449 Form is attached.

SUMMARY

It is submitted that none of the references, either taken along or in combination, teach the present claimed invention. Thus, claims 1-19 are deemed to be in a condition suitable for allowance. Reconsideration of the claims and an early notice of allowance are earnestly solicited.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: October 26, 2005

By:
John C. Garvey
Registration No. 28,607

1201 New York Avenue, NW, Suite 700
Washington, D.C. 20005
Telephone: (202) 434-1500
Facsimile: (202) 434-1501